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ABSTRACT

Presented are three reports exploring student attrition at the National Technical Institute for the Deaf (NTID). The first report contains profile data on 302 students entering NTID in 1976 and attending the Summer Vestibule Program. Profile data given include both demographics (such as age, sex, race, parent data, and marital status) and communication characteristics (such as speechreading, written language, and vocabulary profiles). The second report describes analyses performed on 419 former NTID student data in an attempt to identify characteristics differentiating program completers and withdrawals. It is noted that results of comparisons of demographic, programmatic, and audiological data indicated that none of the variables used differentiated between completers and withdrawals. The third report describes further analyses of data on the same group of 419 Ss in an attempt to analyze attrition through a comparison of transfer students with completers and Ss who left for reasons other than transfer. It is concluded that the analyses failed to discriminate significantly between the groups of Ss. (IM)

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ATTRITION AT NTID

William A. Welsh, Fred L. Wilson

Office for Program Analysis

National Technical Institute for the Deaf

EC102463

1. This research report was completed in the course of an agreement between the National Technical Institute for the Deaf (NTID) and the Department of Health, Education, and Welfare (DHEW), but does not necessarily represent the official opinions of DHEW or NTID.

2. The Assistance of the English Department in making their data available is appreciated.

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1976 Entering Student Profile[12]

William A. Welsh, Fred L. Wilson

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2. The assistance of the English Department in making their data available is appreciated.

This report contains profile data on students entering NTID in 1976 and attending the Summer Vestibule program that year. Profile data are broken down here into two categories: that related to demographics and that related to communication characteristics. Demographic data include: age, sex, race, marital status, high school type, college experience (if any), education level of parents, parental deafness, and place of residence. Comparisons are made with the national census of the deaf (Schein and Delk, 1974), where comparable data from this source are available.[1]

Table I: Year of Birth

Time Period	Percentage of NTID Students
1930-53	10.3
1954-55	16.9
1956-58	72.8

Table II: Sex

		National Census Data	
Sex	NTID Students (%)	Prevocationally Deaf (%)[2]	All Deaf (%)
Male	61.3	48.7	58.7
Female	38.7	51.3	41.3

1. It should be noted that data for the national census was collected in 1971-72, and changes in demography may have occurred in the time that has elapsed since then. Nonetheless, this work contains the best national data that is currently available.

2. "Prevocationally deaf", as defined by Schein and Delk, include all those persons whose age of onset in eighteen years old or less.

Table III: Race

The NTID data and the national census data are organized differently; hence, the need for separate charts.

IIIA: NTID Students

Race	Percentage
Oriental	1.3
Black	2.0
Spanish	0.3
Other	95.7
Not coded	0.7

IIIB: National Census

Race	Percentage
White	90.7
Non-White	9.3

Table IV: Marital Status

Status	NTID Students %	Nationally (%)
Single	97.7	34.1
Married	2.3	60.0
Divorced	0	3.8
Widowed	0	2.1

Table V: Type of High School Last Attended

High School Type	Percentage of NTID Students
Schools for Hearing Persons	28.1
School for the Hearing with Classes for the Deaf	15.2
Public Residential Schools	49.7
Private Residential Schools	2.3
Private Day Schools for the Deaf	2.3
Public Day Schools for the Deaf	2.3

National Census data is not organized in the same fashion, and direct comparisons should be avoided. It is included here because it may be of interest to those reading this document.

Type of School Attended	Percentage
Residential School Only	50.0
Day School Only	5.3
Day Class Only	3.3
Combination of Schools for the Deaf	10.6
Both Schools for the Hearing and Schools for the Deaf	21.8
Schools for Hearing Persons Only	9.0

Table VI: Other College Experience

Other Post-Secondary Education	Percentage of NTID Students
Some College	16.6
No College	83.4

Table VII: Education Level of Parents of NTID Students

Education Level	Father (%)	Mother (%)
Elementary	24.2	19.5
Secondary	40.7	56.3
2-Year College	6.6	7.9
4-Year College	13.9	9.3
4-Year College Plus	10.6	4.3
Not Known	4.0	2.6

Table VIII: Parental Deafness

Category	NTID Student (%)	National Census Data (%)
Both Parents Hearing	92.7	91.7
One Parent Deaf	1.0	0.8
Both Parents Deaf	6.3	3.2
Unknown	0.0	4.3

Table IX: Geographic Distribution

		National Census Data	
Area	NTID Students	All Deaf	Prevocationally Deaf
Northeast	44.4	19.1	20.4
North Central	30.8	30.6	33.0
South	17.2	31.8	30.0
West	7.6	18.4	16.5

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.

North Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minneosota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia. Included among the NTID students are two individuals from Puerto Rico.

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

Data related to communication characteristics includes the following age at onset of deafness, hearing aid use, and assessments of the following skills: unaided speed discrimination, speech intelligibility, speech-reading (with and without sound), manual reception, simultaneous reception, written language skills, reading comprehension skills, and vocabulary. Detailed discussions of these skills are given by Johnson (1976).

Table X: Age at Onset of Deafness

Age Group	NTID Students[2] (%)	National Census Data - Prevocationally Deaf Persons (%)
Birth - Less than 1	76.3	54.0
1 - 2	14.1	19.6
3 - 5	7.3	14.9
6 - 11	1.7	7.9
12 - 18	0[3]	3.6

2. Percentages are of those 177 students for whom this data is available. Age of onset is unknown for 125 others.

3. One NTID student became deaf at the age of 20.

Table XI: Hearing Aid Use

Category	NTID Students (%)
Never use	7.9
Seldom use	5.0
Sometimes use	2.3
Most times use	14.9
Always use	47.0
Have no heaing aid	22.8

Table XII: Unaided Discrimination Profile

Profile Score	Percentage
1	9.3
2	32.5
3	30.5
4	21.5
5	4.6
Unknown	1.7

Interpretation of Profile Scores

1. Student cannot understand any of the message.
2. Student understands little of the content of the message, but recognize a few isolated words or phrases.
3. Student understands, with difficulty, about half of the message (understanding may improve with increase exposure).
4. Student understands most of the content of the message.
5. Student understands the complete message.

Table XIII: Speechreading Profiles

Profile Score	Percentage (without sound)	Percentage (with sound)
1	1.7	6.6
2	28.8	16.9
3	33.8	10.6
4	31.1	14.9
5	2.0	48.0
Unknown	2.6	3.0

Profile Scores are interpreted as are those for unaided discrimination (Table XII).

Table XIV: Manual Reception Profile

Profile Score	Percentage
1	9.3
2	11.6
3	10.3
4	24.5
5	42.5
Unknown	2.0

Profile scores are interpreted as are those for unaided discrimination (Table XII).

Table XV: Simultaneous Reception Profile

Profile Score	Percentage
1	0.3
2	1.0
3	9.6
4	24.2
5	62.6
Unknown	2.3

Profile scores are interpreted as are those for unaided discrimination (Table XII).

Table XVI: Speech Intelligibility Profile

Profile Score	Percentage
1	11.9
2	11.3
3	24.8
4	37.1
5	14.2
No rating	0.7

Interpretation of Profile Scores

1. Listener cannot understand the message.
2. Listener understands little of the content of the message, but does understand a few isolated words or phrases.
3. Listener understands, with difficulty, about half of the message. (Intelligibility may improve after a listening period).
4. Listener understands most of the content of the method.
5. Listener understands the complete message.

Table XVII: Written Language Profile

Profile Score	Percentage
1	0.0
2	8.9
3	59.0
4	9.6
5	22.5

Interpretation of Profile Scores

1. Student cannot express the content of the message in written English.
2. Student expresses little of the content of message, but does use isolated works or phrases appropriately in written English.
3. Student expresses, with difficulty and many errors, about half of the content of the message in acceptable written English.
4. Student expresses most of the content of the message with noticeable errors in written English.
5. Student expresses the complete message in acceptable written English.

Table XVIII: Reading Comprehension Profile

Profile Score	Percentage
1	19.2
2	27.2
3	25.1
4	13.3
5	15.2

Interpretation of Profile Scores

1. Student cannot comprehend the message in written English.
2. Student comprehends little of the content of the message in written English.
3. Student comprehends, with difficulty, about half of the message in written English.
4. Student comprehends most of the content of the message in written English.
5. Student comprehends the complete message in written English.

Table XIX: Vocabulary Profile

Profile Score	Percentage
1	11.3
2	17.2
3	24.1
4	16.3
5	31.1

Interpretation of Profile Scores

1. Students cannot understand any of the individual words in written English.
2. Student understands only a few of the individual words in written English.
3. Student understands, with difficulty, about half the individual words in written English.
4. Student understands most of the words in written English.
5. Student has complete understanding of individual words in written English.

References

Johnson, D.D. Communication characteristics of a young deaf adult population: Techniques for evaluating their communication skills. American Annals of the Deaf, 121, 4, pp. 409-424.

Schein, J.D., and Delk, M.T., Jr. The deaf population of the United States. Silver Spring, Maryland: National Association of the Deaf, 1974.

A Preliminary Examination of Attrition at NTID[1,2]

William A. Welsh, Fred L. Wilson

Office for Program Analysis
National Technical Institute for the Deaf

1. This research report was completed in the course of an agreement between the National Technical Institute for the Deaf (NTID) and the Department of Health, Education, and Welfare (DHEW), but does not necessarily represent the official opinions or policies of DHEW or NTID.

2. The assistance of Carol Finch, Carole Pepe, Albert Smith, Diane Bills and Edward Nedimala of the Office for Program Analysis, and of Dr. David Passmore of the Department of Career Opportunities is greatly appreciated.

Abstract

Analyses were performed on a group of former NTID students to determine whether or not characteristics could be identified that differentiate significantly between program completers and withdrawals. Certain demographic (sex, race), programmatic (type of high school last attended, program at NTID), and audiological (hearing loss, specch intelligibility, simultaneous reception) data, as well as DAT and CGPP test scores, were considered as predictor variables. Results indicated that none of the variables used in the study differentiated in an important way between completer and withdrawals.

The preliminary nature of this report is emphasized, and directions for necessary further research are recommended.

I. Introduction

This is the first in a series of studies designed to address two broad questions: "Is NTID serving the population it was created to serve?" and "How well is NTID serving its students?" The conjecture was put forth that, if NTID was indeed providing all necessary services for the right population, it would not be losing significantly more women than men, minorities than whites, Engineering Technology majors than Business Technology majors, etc. If the school were losing unusually large clusters of students from particular majors, racial groups, sex groups, high school groups, etc., a potentially serious problem would be identified. The basic purpose of the study was to determine whether or not NTID was in fact losing such clusters of student. It is to be regarded only as a preliminary examination of attrition at the Institute.

II. Methodology

For purposes of this study, students were divided into two groups only; graduates and withdrawals. The "graduates" category included any student who had completed any certificate, diploma, associate's degree, or advanced program with certification creditation from the department, DCO, and/or the Dean. The "withdrawals" category contained anyone who left NTID for any reason without completing any program, and who have not (as yet, at least) returned.

The study was conducted using only those students who entered NTID for the Summer Vestibule Program of 1972 or later (The population size for the study was 419). This was done for two reasons: First, there is a widely held belief that the NTID program of the first few years and that of the past few years is very different. If this is true, patterns of attrition are apt to be different for the two time periods. Second, certain data of concern here were available only on students who came in 1972 or later. In addition, there were seven students in this group who completed one level of a program and attempted a higher level, but failed; they were excluded from the analysis. Students on leaves of absence were excluded as well.

It will be noted, of course, that this is not the way that attrition has traditionally been thought of at NTID; heavy emphasis has been placed upon reasons for withdrawal. If we are determining whether or not any broad patterns of attrition exist, however, we must examine all of those who have withdrawn for whatever reason. Note, also, that this is only a first look at the attrition process; subsequent studies can (and will) break down the "graduate" and "withdrawal" groups further.

The total population included in the analysis consisted of 419 students, of which 207 were graduates and 212 were withdrawals.[1]

Characteristics on which the students were examined in this analysis are:

1. Program: Five categories of programs were considered: Business Technologies, Visual Communications Technologies, Technical Sciences, Engineering Technologies, and advanced programs. Students who attended one of the Summer Vestibule Programs, but did not appear for anything else, were placed in a sixth, separate category. This braakdown is admittedly somewhat arbitrary. Others that were suggested included; combining like NTID and advanced programs (e.g., Engineering and Engineering Technologies); grouping by major other than program; and other methods. Any such breakdown is equally arbitrary. Others can be examined in subsequent studies if such action appears warranted.
2. Sex

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[1]This should not be regarded as indicative of a fifty percent attrition rate. Many of those who enrolled in these years are still at NTID. Given that graduates are nearly always here longer than withdrawals, the percentage of withdrawals in this population is not indicative of the "true" attrition rate. In other words, most of the withdrawals from this group will have left already. Fewer of the graduates will have completed.

A somewhat more rigorous statistical examination of the attrition rate is contained in Appendix A.

3. Race: Caucasian and Minority. Unfortunately, numbers of individual minority groups were too small to allow for a more precise analysis. Hence, it was necessary to group them together.
4. High School Type: Last high school attended prior to NTID. The three categories are schools for hearing persons, schools for the deaf, and schools for hearing persons with classes for the deaf.
5. Differential Aptitude Test (DAT) scores: Subtests include Verbal Reasoning, Numerical Ability, Abstract Reasoning, Clerical Speed and Accuracy, Mechanical Reasoning, Space Relations, Spelling, and Grammar
6. Comparative Guidance and Placement Program (CGPP) Test Scores: Subtests include Reading, Sentences, Mathematics, Year 2000, Mosaic Comparisons, and Letter Groups.
7. Puretone Hearing Loss: Calculated by the regression method developed by F. Wilson and E. Nedimala of the Office for Program Analysis.
8. Speech Intelligibility: Most recent profile score.
9. Simultaneous Reception: Most recent measurement; raw score used for analysis, rather than profile.

Several analyses were performed. A correlation matrix among all the variables was obtained. Tests of significant (t-tests on linear measures; chi-squares, phi coefficients, and Cramer's V on

nominal measures) were applied to determine whether graduates and withdrawals differed signficantly on any of the variables of concern. Finally, the techniques of multiple regression and discriminant analysis were applied to determine the degree to which the aforementioned variables account for the difference between graduates and withdrawals.

III. Results and Discussion

The matrix in Table I reveals that the only correlations above 0.4 were among DAT and CGPP students, and among the hearing loss, speech intelligibility, and simultaneous reception variables. While these correlations are of course very important, they are not a primary concern of this particular study.

The t-tests (Table II) revealed that on only one measure - namely, the CGPP Reading Test - could the hypothesis of no statistically significant difference between graduates and withdrawals be rejected. It is important to note that the difference in mean scores on this measure is the difference between the fourth and eighth percentile nationally, and very likely not educationally significant. A word of caution: the reader will note that, depending on the test, between thirteen and twenty-four percent of the subjects were not measured; any interpretations are thus rendered somewhat more tenuous.

Analysis of the crosstabulations and related statistics (Table III) reveal that the hypothesis of no significant differences can be rejected for the program and speech intelligibility variables. No significant differences existed between graduates and withdrawals on the other variables.

Results with regard to speech intellibility are somewhat puzzling, especially for those whose profile score is "4" or "5". Perhaps those with very high speech intelligibility transfer more frequently to other colleges. This will be examined further in a subsequent study. With regard to programs, it appears that more Visual Communications majors - and fewer among those registered in advanced programs - complete programs than those in the other programs. Further analysis (Table IV) revealed that there may be a connection between the greater number of completers in Visual Communications and the fact that many more certificates and diplomas are awarded in this as opposed to other, programs. The situation with regard to those in advanced programs is less clear, thought it may be that, among all withdrawals, more from this group than from other programs leave to transfer to other colleges. This situation will also be examined in a subsequent study.

It should be noted carefully that significant t-values, chi-squares, etc., only permit the rejection of the hypothesis of no significant difference between graduates and withdrawals on the variable of

concern. Very high t-values, chi-squares, etc., indicate the degree of confidence with which the hypothesis can be rejected, but are not measures of the strength of the relationship of the two variables. For this measure, the tools used were regression analysis and discriminant analysis.

Results of the regression analysis (Table V) indicate that all the variables of concern account for 30.5 percent of the difference between graduates and withdrawals. None of the individual measures accounted for an important part of the total variance, however; the leading indicator was the CGPP Reading test, which accounted for only 3.8 percent. Almost seventy percent of the variance - i.e., the almost seventy percent of that cluster of factors that explains fully the difference between graduates and withdrawals - remains unexplained.

The regression analysis helps to put some of the differences revealed in Table III in perspective. Although the differences between graduates and withdrawals in the Visual Communications and advanced programs for example, are interesting, and statistically signficant, they are not of sufficient magnitude to explain very much of the difference between the two large "graduate" and "withdrawal" subgroups. The relationships of program, speech intelligibility, and CGPP Reading Score with status, while not insignificant, are of very small magnitude.

As would be expected, the discriminant equation accounted for the same percentage of the difference in graduation status as did the regression equotion. Table VI illustrates the accuracy with which the disciminant equation can be used to classify individuals, given measures on the variables of concern. There is no absolute standard by which predictive equations are judged satisfactory or unsatisfactory. It should be noted that even if every student were classified as a withdrawal, the number correctly classified would still be over fifty percent.

IV. Conclusions

Where does all of this leave us? It is important and positive for NTID -that sex, minority group status, major, and attendance at a particular type of high school are all very poor predictors of graduation likelihood. It would indicate a possible problem if NTID were losing an inordinate number of women, minorities, Engineering majors (for example), or students from schools for hearing persons. This study has pointed up no such problems.

The study also found no educationally signficant differences between the two groups on any of the DAT or CGPP tests. It should be noted, however, that these tests do not, in general, appear to discriminate very well amont the ability levels of NTID students. Different instruments have been used more recently in some departments, and when data are available on a sufficient number of

graduates and withdrawals, they will no doubt be helpful in analyses such as those performed in this study.

Subsequent studies should (and will) take at least two directions: (1) the search must be continued for variables that will help to more fully explain the variance in status; and (2) the "withdrawal" group must be divided according to reasons given for withdrawal. Analyses among the resulting subgroups can then be conducted.

TABLE I: CORRELATION MATRIX

	PROG	HSCODE	RACE	SEX	ABT	CLS	VRE	NUM	SPE	MRE	SRE	REA	SEN	MAT	YR2
PROG	1.00	-.11	-.06	-.05	.13	.04	.16	.00	.14	.14	.11	.25	.16	.09	.22
HSCODE	-.11	1.00	-.04	.00	-.02	.00	-.13	.05	-.09	-.04	-.08	-.12	-.15	-.04	-.19
RACE	-.06	-.04	1.00	.04	-.12	.01	-.12	-.09	-.06	-.11	-.09	-.08	.04	-.09	-.11
SEX	-.05	.00	.04	1.00	-.01	.22	.05	-.09	.15	-.35	-.15	-.04	.02	-.10	.02
ABT	.13	-.02	-.12	-.01	1.00	.18	.18	.32	.16	.40	.44	.25	.19	.40	.30
CLS	.04	.00	.01	.22	.18	1.00	-.13	.10	.23	.06	.19	.01	.04	.23	.05
VRE	.16	-.13	-.12	.05	.18	-.13	1.00	.40	.38	.24	.20	.52	.54	.25	.50
NVM	.00	.05	-.09	-.09	.32	.10	.40	1.00	.28	.23	.37	.19	.30	.60	.26
SPE	.14	-.09	-.06	.15	.16	.23	.38	.28	1.00	.21	.09	.32	.49	.27	.41
MRE	.14	-.04	-.11	-.35	.40	.06	.24	.23	.21	1.00	.56	.26	.27	.37	.39
SRE	.11	-.08	-.09	-.15	.44	.19	.20	.37	.09	.56	1.00	.14	.15	.43	.28
REA	.25	-.12	-.08	-.04	.25	.01	.52	.19	.32	.26	.14	1.00	.56	.28	.66
SEN	.16	-.15	-.04	.02	.19	.04	.54	.30	.49	.27	.15	.56	1.00	.29	.60
MAT	.09	-.04	-.09	-.10	.40	.23	.25	.60	.27	.37	.43	.28	.29	1.00	.32
YR2	.22	-.19	-.11	.02	.30	.05	.50	.26	.41	.39	.28	.66	.60	.32	1.00
MOS	-.05	-.09	-.03	.09	.23	.46	.14	.29	.09	.18	.44	.02	.08	.29	.14
LET	.03	-.08	-.08	.07	.38	.32	.24	.39	.22	.27	.40	.19	.18	.43	.34
HL	.04	.08	.01	.05	-.07	.15	.03	.14	.05	-.03	.09	-.01	.06	.13	-.03
SPINT	.12	-.29	-.09	.03	.19	-.09	.20	-.04	.18	.13	.00	.24	.24	.07	.34
SIMUL	.05	-.06	-.04	.14	.21	.08	.14	-.01	.31	.16	.05	.20	.28	.12	.36

TABLE I: CORRELATION MATRIX

	MOS	LET	HL	SPINT	SIMUL
PROG	-.05	.03	.04	.12	.05
HSCODE	-.09	-.08	.08	-.29	-.06
RACE	-.03	-.08	.01	-.09	-.04
SEX	.09	.07	.05	.03	.14
ABT	.23	.38	-.07	.19	.21
CLS	.46	.32	.15	-.09	.08
VRE	.14	.24	.03	.20	.14
NUM	.29	.39	.14	-.04	-.01
SPE	.09	.22	.05	.18	.31
MRE	.18	.27	-.03	.13	.16
SRE	.44	.40	.09	.00	.05
REA	.02	.19	-.01	.24	.20
SEN	.08	.18	.06	.24	.28
MAT	.29	.43	.13	.07	.12
YR2	.14	.34	-.03	.34	.36
MOS	1.00	.14	.16	-.03	.01
LET	.38	1.00	.08	.11	.14
HL	.16	.08	1.00	-.53	-.28
SPINT	-.03	.11	-.53	1.00	.46
SIMUL:	.01	.14	-.28	.46	1.00

Index:

PROG: Student program

HSCODE: Type of High School attended

ABT: DAT - Abstract Reasoning Score

CLS: DAT - Clerical Score

VRE: DAT - Verbal Reasoning Score

NUM: DAT - Numerical Ability Score

SPE: DAT - Spelling Score

MRE: DAT - Mechanical Reasoning Score

SRE: DAT - Special Relations Score

REA: CGPP - Reading Score

SEN: CGPP - Sentences Score

MAT: CGPP - Combined Math Scores

YR2: CGPP - Year 2000 Score

MOS: CGPP - Mosaic Composition Score

LET: CGPP - Letter Group Score

HL: Hearing Loss

SPINT: Speech Intelligibility Profile

SIMUL: Simultaneous Reception Raw Score

TABLE II: t-Tests

VARIABLE	NO. OF CASES	MEAN	STANDARD DEVIATION	t-VALUE	DEGREES OF FREEDOM	2-TAIL PROBABILITY
Hearing loss						
Withdrawals	161	84.5	17.7	.43	333	.666
Graduates	174	85.3	16.6			
Simultaneous Reception						
Withdrawals	167	79.4	15.0	.56	363	.577
Graduates	198	80.3	13.2			
DAT Abstract Reasoning						
Withdrawals	155	29.5	13.0	.54	296	.587
Graduates	143	30.4	14.3			
CGPP Year 2000						
Withdrawals	188	31.9	10.2	1.74	353	.083
Graduates	167	30.2	8.1			
DAT Verbal Reasoning						
Withdrawals	168	15.9	10.0	1.74	314	.084
Graduates	148	14.3	5.2			
DAT Numerical Ability						
Withdrawals	165	20.3	7.2	1.04	311	.301
Graduates	148	21.1	7.6			
CGPP Reading Score						
Withdrawals	188	34.9	8.5	3.22	353	.001
Graduates	167	32.3	5.7			
CGPP Math Scores-Combined						
Withdrawals	185	45.2	7.5	.46	345	.644
Graduates	162	45.6	7.5			

TABLE III: Crosstabulations, Chi-Squares, and Related Statistics

A. STATUS/RACE

STATUS/RACE	MINORITY	CAUCASIAN	ROW TOTAL
WITHDRAWALS	16	196	212
GRADUATES	14	193	207
COLUMN TOTAL	30	389	419

Chi Square = .01480
Degrees of Freedom = 1
Significance = .90317
Phi = .01520

B. STATUS/SEX

STATUS/SEX	MALE	FEMALE	ROW TOTAL
WITHDRAWALS	148	64	212
GRADUATES	138	69	207
COLUMN TOTAL	286	133	419

Chi Square = .34390
Degrees of Freedom = 1
Significance = .55759
Phi = .03378

C. STATUS/PROGRAM

	Business Tech.	Visual Comm.	Engin. Tech.	Tech. Science	SVP Only	Advanced Programs	Row Total
Withdrawals	50	41	35	25	31	17	199
Graduates	61	76	37	26	0	7	207
Column Total	111	117	72	51	31	24	406

Chi Square = 46.66243
Degrees of Freedom = 5
Significance < .00001
Cramer's V = .33902

D. STATUS/SPEECH INTELLIGIBILITY

	Profile Score 1	2	3	4	5	Unknown	Row Total
Withdrawals	31	29	50	39	25	38	212
Graduates	32	34	64	62	9	6	207
Column Total	63	63	114	101	134	44	419

Chi Square = 38.11749
Degrees of Freedom = 5
Significance < .00001
Cramer's V = .30162

E. STATUS/HIGH SCHOOL TYPE

	HEARING SCHOOL NO DEAF PROGRAM	HEARING SCHOOL DEAF PROGRAM	SCHOOL FOR THE DEAF	ROW TOTAL
Withdrawals	55	22	135	212
Graduates	66	23	116	205
Column Total	121	45	251	417

Chi Square = 2.34362
Degrees of Freedom = 2
Significance = .30981
Cramer's V = .07497

TABLE IV: Crosstabulation of Degree by Program and Related Statistics

	Certificate	Diploma	Associates	Bachelors	Masters	Row Total
Business Technologies	4	11	46	0	0	61
Visual Communications	8	54	14	0	0	76
Engineering Technologies	2	21	14	0	0	37
Technical Science	0	3	23	0	0	26
Advanced Programs	0	0	5	1	1	7
Column Total	14	89	102	1	1	207

Chi Square = 127.36966
Degree of Freedom = 16.
Significance < .00001

Table V: Regression Analysis Results

Variable Name	Multiple R	R Square	R-Square Change	Simple R
CGPP Reading	.194	.038	.038	-.194
CGPP Letter Group	.245	.060	.022	.124
Registration in Advanced Programs	.293	.086	.026	-.176
CGPP Sentences	.322	.103	.017	.004
DAT Verbal Reasoning	.363	.132	.028	-.155
Speech Intelligibility Profile II	.385	.149	.017	-.120
Visual Communication Major	.405	.164	.015	.104
DAT Numerical Ability	.421	.177	.013	.070
Sex	.439	.193	.016	-.058
Attendance at Hearing School With No Deaf Program	.452	.205	.012	.028
CGPP Year 2000	.465	.216	.012	-.144
Race	.482	.232	.016	.064
Technical Science Major	.488	.238	.006	.048
CGPP Mosaic Composition	.493	.244	.005	.097
Speech Intelligibility Profile III	.500	.250	.006	.015
Business Technologies Major	.504	.254	.004	.019
Engineering Technologies Major	.528	.279	.025	.012
CGPP Math Scores - Combined	.532	.283	.004	.021
Attendance at Hearing School With Deaf Program	.536	.287	.004	.086
DAT Spacial Relations	.539	.291	.004	.764
DAT Spelling	.541	.292	.015	-.016
DAT Clerical	.542	.294	.002	.114
DAT Mechanical Reasoning	.544	.295	.002	-.018
Speech Intelligibility Profile V	.545	.297	.001	.017
Speech Intelligibility Profile IV	.548	.300	.003	.113
Hearing Loss	.552	.305	.005	-.002
Simultaneous Reception	.553	.305	.000	-.015

Table VI: Predictive Accuracy of Discriminant Equation

Group	Predicted as Withdrawals	Predicted as Graduates
Withdrawals	67.8%	32.2%
Graduates	17.8%	82.2%

75.6% of all cases were classified correctly.

Appendix A

In an attempt to specify the rate of attrition (as it has traditionally been defined by institution of higher learning), quarters 714 (Summer 1972) to 753 (Spring 1976) were examined.

The total number of students who registered during these quarters was 858. The total number of withdrawals during these quarters was 199. The attrition rate for this period of time is 23.2 per cent.

ANOTHER APPROACH TO THE ANALYSIS OF ATTRITION AT NTID

National Technical Institute for the Deaf
Office for Program Analysis

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March 14, 1977

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ABSTRACT

The purpose of this report was to determine whether a set of independent variables could be better used to analyze attrition if groups were constructed differently than in a previous report. Two analyses were conducted: a comparison of transfer students and those who left for other reasons, and a comparison of transfers and completers (in one group) with "other leavers" in a second group. Some interesting differences suggested themselves in the first of these analyses, but no conclusive statement could be made because the small number of transfers made complete analysis impossible. In the second analysis, the independent variables fail to discriminate in an important way between "transfers/completers" and "other leavers".

Introduction

In a previous report by these authors (Welsh and Wilson, 1976), it was shown that a set of selected demographic, achievement/aptitude, and audiological measures was able to account for approximately thirty percent of the total difference between completers and withdrawals. For the purposes of that report, "withdrawals" were defined as anyone who left without completing any program, and who has not returned. "Completers" were defined as anyone receiving a certificate, diploma, associate's, or advanced degree from any program. Since the overarching concern of the authors is identification of correlates/predictors of success at NTID, the implied definition of "success" in that study was "completion" of a program.

One of the most common criticisms of this type of analysis was related to the decision to put all withdrawals into one category. It was pointed out that students withdraw from NTID for a variety of reasons, and certainly not all of them are negative. Reasons given by the students for withdrawal are coded in The History of Student Status (HOSS) file as follows: (1) none given; (2) unknown; (3) career objective; (4) employment; (5) homemaker; (6) medical; (7) personal adjustment; and (8) transfer to another college.

Frequencies[1] for these reasons are as follows:

Table I: Reasons Given by NTID Students for Withdrawing

Reason	Frequency	Percent
None given	0	0.0
Unknown	15	7.1
Career Objective	95	44.8
Employment	8	3.8
Homemaker	0	0.0
Medical	10	4.7
Personal Adjustment	37	17.5
Transfer	47	22.2

1. The population used in this study is, as in the study cited above, all those students who began in SVP 1972 or later, and who have either completed a program or have left without completing and not returned.

Given only these categories, it is difficult, if not impossible, to determine for which students withdrawal was a positive step and for whom the decision to leave represented at least a temporary setback. As a result, we had to generate an arbitrary classification system. In the study cited previously, the implicit definition of "success" was "completion"; this, of course, was arbitrary. In this study, we have included transfers in the group for whom NTID was a positive experience. We have assumed that, for at least most of the transfer students, their (1) decision to remain in higher education, and (2) perceived ability to function outside the NTID environment, were positive for the student. It appeared much more difficult to make similar assumptions about those leaving for any other reason. Our initial step, then, was to compare "transfers" and "other leavers" in a fashion similar to that used in the previously cited study.

II. Methodology

Independent variables included in the analysis were: sex, race, high school type, program at NTID, selected DAT and CGPP test scores, speech intelligibility, hearing loss, and simultaneous reception score. Multiple methods of analysis were used: t-tests on continuous variables, crosstabulations, chi-squares, phi coefficients, and Cramer's V for discrete variables, as well as a number of regression and discriminant analyses.

III. Results

Results of t-tests are shown in Table II.

Table II: t-tests Comparisons of

Transfers and Other Leavers

Variable	No. of Cases	Mean	Standard Deviation	t-value	Degrees of freedom
Hearing Loss					
Other Leavers	119	84.1	18.0	0.41	159
Transfers	42	85.4	16.9		
Simultaneous Reception					
Other Leavers	125	78.6	15.5	1.30	165
Transfers	42	82.0	13.3		
DAT Abstract Reasoning					
Other Leavers	122	29.2	13.3	0.50	153
Transfers	33	30.5	11.6		
CGPP Year 2000 Test					
Other Leavers	145	31.8	9.7	0.23	186
Transfers	43	32.3	11.6		
DAT Verbal Reasoning					
Other Leavers	133	15.3	8.2	1.56	166
Transfers	35	18.3	15.0		
DAT Numerical Ability					
Other Leavers	131	19.7	6.6	1.82	163
Transfers	34	22.2	8.8		
CGPP Reading					
Other Leavers	145	34.9	8.4		
Transfers	43	35.0	8.9	0.07	186
CGPP Math Scores					
Other Leavers	143	45.1	7.6	0.60	133
Transfers	42	45.9	7.2		

None of the t-tests yielded results statistically significant at the .01 level. However, two scores (DAT Verbal and Numerical) approach

significance at the .05 level; moreover, on each of the measures of achievement, transfers scored at least somewhat higher than other leavers. Such a pattern is certainly interesting, and indicates at least that further analyses need to be considered.

Crosstabulations, chi squares, phi coefficients, and Cramer's V statistics are contained in Table III.

Table III: Crosstabulations and Related Statistics

IIIA: Sex

	Male	Female	Row Total
Other Leavers	117	48	165
Transfers	31	16	47
Column Total	148	64	212

Chi Square = 0.22

Significance = 0.64

Phi = 0.04

IIIB: Race

	Non-White	White	Row Total
Other Leavers	13	152	165
Transfers	3	44	47
Column Total	16	196	212

Chi Square = 0.00

Significance = 0.98

Phi = 0.02

IIIC: High School Code

	Hearing School, Deaf Program	Hearing School, No Deaf Program	Public Residential	Public Day	Private Residential	Private Day	Row Total
Other Leavers	18	41	99	2	4	1	165
Transfers	4	14	28	1	0	0	47
Column Total	22	55	127	3	4	1	212

Chi Square = 2.19
Significance = 0.82
Cramer's V = 0.10

IIID: Speech Intelligibility Profile

	Profile Score						Row Total
	1	2	3	4	5	Unknown	
Other Leavers	24	18	46	25	17	35	165
Transfers	7	11	4	14	8	3	47
Column Total	31	29	50	39	25	38	212

Chi Square = 20.14
Significance < .01
Cramer's V = 0.31

IIIF: Program at NTID

	Business Technologies	Visual Communications	Engineering Technologies	Technical Science	SVP Only	Cross-Registered	Row Total
Other Leavers	37	39	29	18	26	10	159
Transfers	13	2	6	7	5	7	40
Column Total	50	41	35	25	31	17	199

Chi Square = 13.17
Significance = 0.02
Cramer's V = 0.26

Significant differences between transfers and those leaving for other reasons are present in the "speech intelligibility" and "program at NTID". In general, higher percentages of transfers are present in those with a speech intelligiblity profile score of four or five than among those whose score is between one and three. This may be related to ability to function better in a hearing environment, although any such statement based on this data is much more speculation than conclusion.

With regard to program, it appears that the most interesting differences from the norm are within the Visual Communication students and those who are cross-registered. Only two of forty-one Visual Communication majors who left indicated they were transferring while seven of the seventeen cross-registered students indicated that they intended to remain in higher education.

Several cautions, though: the Cramer's V in both cases is not high, and would clearly be lower were it not for the "unknown" speech intelligibility and "SVP only" program categories. Give these factors, a significant chi square value means only that the hypothesis of no significant difference among groups can be rejected and does not indicate a strong relationship between the variables of concern.

An attempt was made, via discriminant and regression analyses, to determine the degree to which this set of independent variables could account for the difference between transfers and other leavers. Neither a single discriminant nor regression analysis, using all the independent variables, could be performed. There were two reasons for this: (1) missing values existed on many of these variables, and the inclusion of

more than a few variables reduced the number of transfer students included in the analysis -- already a rather low forty-seven -- by fifty percent or more; and (2), as the number of independent variables approaches the number of cases, the validity of both these statistical procedures decreases.

As a result of these conditions, many different sets of four and five independent variables were used; none accounted for an important percentage of group differences. No set of variables accounted for more than 6.5 percent of the variance between the two groups, and no set significantly exceed fifty percent accuracy in predicting membership in the transfer student group. To give the reader an idea of the weakness of these smaller clusters of variables, one example may be cited. The best combination of variables was one of program, high school code, race, and sex; the amount of variance accounted for was 6.4 percent. The predictive effectiveness of the discriminant equation looked like this:

Table IV: Predictive Effectiveness of Discriminant Function

Actual Group	% Predicted as Other Leavers	% Predicted Transfers
Other Leavers	66.0	34.0
Transfers	52.5	47.5

Other combinations were of the same general predictive utility, i.e., bordering on zero. On the basis of possible analyses, then, it must be concluded that none of the independent variables discriminated in a statistically important way between "transfers" and "other leavers".

IV: Need for Further Analysis

We felt that the preceding analysis was incomplete for at least two reasons: (1) it was not possible to perform a regression or a discriminant analysis using all, or even most, of the independent variables; and (2) the results of such an analysis, even if clear, would not tell us enough about those for whom the NTID experience had been a positive one. In an attempt to circumvent these problems, we undertook another analysis.

For this second analysis, transfers and completers were grouped together; other leavers were regarded as dropouts from higher education, and placed in a second category. Analysis similar to the ones performed in the first section of this paper were repeated.

Results of the t-tests performed were as follows:

Table I: t-test Comparisons of Transfers/Completers and Other Leavers

Variable	No. of Cases	Mean	Standard Deviation	t-value	Degrees of freedom
Hearing Loss					
Leavers	119	84.1	18.0	0.60	333
Transfers/completers	216	85.3	16.6		
Simultaneous Reception					
Leavers	125	78.6	15.5	1.30	363
Transfers/Completers	240	80.5	13.2		
DAT Abstract Reasoning					
Leavers	122	29.2	13.4	0.72	296
Transfer/Completers	176	30.4	13.8		
CGPP Year 2000 Test					
Leavers	145	31.4	9.7	1.20	353
Transfers/Completers	210	30.7	8.9		
DAT Verbal Reasoning					
Leavers	133	15.3	8.2	0.24	314
Transfers/Completers	183	15.1	8.1		
DAT Numerical Ability					
Leavers	131	19.7	6.6	1.88	311
Transfers/Completers	182	21.3	7.8		
CGPP Reading					
Leavers	145	34.9	8.4	2.46	352
Transfers/Completers	210	32.9	6.6		
CGPP Math Scores					
Leavers	143	45.1	7.6	0.74	345
Transfers/Completers	204	45.7	7.4		

These results seem to lend themselves to no clear conclusions with regard to group differences on these variables. Each group scored higher on some measures, lower on others.

Results of the Crosstabulations are as follows:

Table VI: Crosstabulations and Related Statistics

VIA: Sex

	Male	Female	Row Total
Leavers	117	48	165
Transfers and Completers	169	85	254
Column Total	286	133	419

Chi Square = 0.69

Significance = 0.41

Phi = 0.05

VIB: Race

	White	Non-White	Row Total
Leavers	13	152	165
Transfers and Completers	17	237	254
Column Total	30	389	419

Chi Square = 0.08

Signifance = 0.78

Phi = 0.00

VI C: High School Type

	Hearing School, Deaf Program	Hearing Scool, No Deaf Program	Public Residential	Public Day	Private Residential	Private Day	Row Total
Leavers	18	41	99	2	4	1	165
Transfers and Completers	27	80	126	9	10	0	252
Column Total	45	121	225	11	14	1	417

Chi Square = 7.83
Significance = 0.17
Cramer's V = 0.14

VI D: Speech Intelligibility Profile Score

	1	2	3	4	5	Unknown	Row Total
Leavers	24	18	46	25	17	35	165
Transfers and Completers	39	45	68	76	17	9	254
Column Total	63	63	114	101	34	44	419

Chi Square = 43.57
Significance $<$ .00001
Cramer's V = 0.32

VI E: Program

	Business Technologies	Visual Communications	Engineering Technologies	Technical Science	SVP Only	Cross-Registered	Row Total
Leavers	37	39	29	18	26	10	159
Transferred and Completers	74	78	43	33	5	14	247
Column Total	111	117	72	51	31	24	406

Chi Square = 29.68
Significance $<$ .0001
Cramer's V = 0.27

Again, comparisons yield no clear differences between the two groups. The significant chi square value for programs is almost certainly primarily attributable to the difference between the "SVP only" group and the programs, and not to differences among programs. Even at that, the Cramer's V value is fairly low. Results with regard to speech intelligibility are less clear, but it does appear that much of the reason for the high chi square is the difference between the "unknown" category and the various profile scores. Again, the Cramer's V is not very high.

A regression analysis was performed to determine the percentage of variance between the two groups that the independent variables could be used to predict. Results are summarized in Table VII.

Table VII: Regression Analysis:

Independent Variables with Transfers/Completers

Variable	Multiple R	R-Square	R-Square Change	Simple R	Beta
CGPP Reading	.164	.027	.027	-.164	-.174
CGPP Sentences	.244	.060	.033	.076	.260
DAT Numerical	.276	.076	.016	.143	.367
DAT Verbal Reasoning	.315	.100	.023	-.064	-.280
CGPP Math Scores	.348	.121	.021	.009	-.244
Speech Intelligibility Profile 4	.376	.141	.020	.123	.219
Speech Intelligibility Profile 5	.398	.158	.017	.039	.229
CGPP Year 2000	.422	.178	.020	-.136	-.239
Hearing Loss	.438	.192	.014	.044	.182

Variable	Multiple R	R-Square	R-Square Change	Simple R	Beta
Speech Intelligibility Profile 3	.449	.202	.010	-.019	.055
Technical Science Major	.458	.210	.008	.105	.483
CGPP Letter Group	.469	.220	.011	.100	.124
Race	.476	.227	.007	.042	.111
Attendance at Hearing School, No Deaf Program	.482	.233	.006	.044	.103
Visual Communications Major	.487	.238	.005	-.014	.508
DAT Mechanical Reasoning	.491	.241	.003	-.059	-.110
Engineering Technologies Major	.495	.246	.005	.049	.384
Business Technologies Major	.514	.264	.018	.015	.486
Registration in Advanced Programs	.526	.276	.012	-.015	.176
Sex	.535	.286	.010	-.025	.176
CGPP Mosaic Composition	.538	.290	.003	.104	.054
Attendance at Hearing School with Deaf Program	.540	.291	.002	.050	.049
Simultaneous Reception	.541	.293	.002	.032	.051
DAT Abstract Reasoning	.542	.294	.001	.018	.042

It is apparent from the "R-square" column that, collectively, the independent variables account for 29.4 percent of the total difference between completers and withdrawals. The variables were entered in the

regression equation in a stepwise fashion, and each number in the "R-square cchange" column indicates the percentage of variance that variable -- working in combination with all the others -- accounts for. No one variable makes a really important contribution.

The "beta" column contains the standardized regression coefficients. These numbers can be used to determine which independent variable would have the greatest effect on the dependent variable if all other independent variables were statistically held constant. For example, all other things being equal, the "DAT Numerical Score" is more closely related to the dependent variable than is "Hearing Loss". It should be noted, however, that since these are standardized coefficients, they can be used to order -- but not compare the importance of -- the independent variables. To continue with the same example, while we can say that DAT Numerical Score is more closely related to group membership than is hearing loss, we cannot say that the relationship is twice as strong. Also, the indicator of the strength of the relationship is the absolute value of the beta weight, rather than its sign.

A discriminant analysis was conducted to test the predictive efficiency of the discriminant function derived from these independent variables. Results are summarized in Table VIII.

Table VIII: Predictive Effectiveness of Discriminant Function

Actual Group	% Predicted as Leavers	% Predicted as Transfers/Completers
Leavers	71.4	28.6
Transfers/Completers	33.1	66.9

Percent of cases correctly classified = 68.53

Variables were entered into the discriminant analysis in a stepwise fashion. The standardized discriminant function coefficients are shown in Table IX.

Table IX: Standardized Discriminant Function Coefficients

Variable	Standardized Weight
DAT Verbal Reasoning	.586
DAT Numerical Ability	-.846
CGPP Reading	.332
CGPP Sentences	-.561
CGPP Math Scores	.493
CGPP Year 2000	.537
CGPP Letter Group	-.243
Hearing Loss	-.257
Attendance at Hearing School, Deaf Program	-.143
Attendance at Hearing School, No Deaf Program	-.230
Race	-.213
Technical Science Major	-.271
Speech Intelligibility Profile IV	-.415
Speech Intelligibility Profile V	-.433

Interpretation is analogous to interpretation of beta weights in the regression analysis. Absolute values are indicators of the order of importance of the variables with regard to their power to discrim-

inate between the two groups, all other variables held constant. The numbers cannot be used for comparative purposes, however.

V: Discussion

A previous report (Welsh and Wilson, 1976) indicated that the independent variables - the same as those used in this study - accounted for 30.5 percent of the difference between "graduates" and "withdrawals". In this study we attempted, by redefining our criterion for success, to see whether or not the independent variables could achieve a greater degree of group separation. Results indicated that the separation accounted for was about the same as in the initial study.

The search for variables that distinguish between those who succeed at NTID and those who do not must continue. Future reports will consider different groupings (grouping of students depends, of course, on the definition of "success" that is employed), and other independent variables. In the immediate future, those independent variables will include average credit hour per quarter and number of major changes.

References

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